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Projection Mapping Celebrating RIMPA 400th Anniversary

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Abstract—2015 is the year of 400th anniversary of RIMPA, one of famous Japanese art schools. To celebrate this special year, the authors organized a projection mapping event at Kyoto National Museum in March 2015. As this is an event to commemorate RIMPA school, the authors tried to create contents based on the concept of RIMPA. At the same time, to appeal that RIMPA should expand into the future, they tried to introduce cutting-edge technologies to create the content. Therefore this event is a good example of how culture and technologies could be integrated together. In this paper both cultural aspect and technical aspect of this event will be described.

Keywords—*projection mapping; RIMPA art school; Wind and Thunder Gods; high-speed camera*

I. INTRODUCTION

Recently projection mapping [1][2][3] has become one of the most popular big events to appeal to and gather lots of audiences. Projection mapping is a method to project still or video images on non-flat and huge screens such as buildings so that the projected objects look like totally different ones. In Japan a big projection mapping was first introduced at the Tokyo Station to celebrate the renewal of the Tokyo Station building [4]. Then after that there have been many projection mapping events, such as the one at Disneyland [5], etc. As for content of projection mapping, so far mostly entertainment focusing contents have been used. However, the authors think that artistic contents would be very well suited as contents of projection mapping. Based on this they have created artistic content and using this organized a projection mapping in Singapore in 2014 [6]. At the same time, they tried to introduce cutting-edge technologies in the content creation process. Also cultural issues such as the change among Japanese four seasons were introduced into the content. As this event was successful, they wanted to do the next projection mapping event in Japan,

as Japanese people have more matured interest and appreciation toward art and culture.

Fortunately 2015 is the 400th anniversary of RIMPA [7][8], one of the most well known art schools in Japan, and there will be many events to celebrate this special year. As the authors, especially Naoko Tosa, has been much interested in RIMPA and already included RIMPA feature into the content of the projection mapping held in Singapore, it is a good chance for them to carry out a projection mapping in Kyoto which is the city with a long history and lots of cultural heritages. Fortunately they could carry out the projection mapping in March 2015 at Kyoto National Museum under the support by Kyoto prefecture government.

When a RIMPA exhibition is carried out, the usual way is to exhibit one or several of famous RIMPA paintings as the core of the event. However, RIMPA is not a simple heritage that existed long time ago. On the other hand, RIMPA is an art concept that has to be handed to present and event to future. Therefore the authors tried to create new RIMPA-style content. Also to appeal the modernity of RIMPA, it is adequate to connect technology and content. Therefore they introduced several cutting-edge technologies in the content creation process. For the projection, twenty most recent high-end projectors with more than 20,000 lumen were used to project the created video content onto the two buildings of Kyoto National Museum. The event gathered almost 20,000 people during the four-day event and was successful.

This paper consists of the following chapters. First in Chapter 2, a brief explanation of RIMPA art school is described to give the readers an basic idea about RIMPA. Then in Chapter 3, it is described that based on the RIMPA concept how the content for the projection mapping has been created. First, the basic story for the content would be explained. Then by combining cultural issues and technologies how the content was created is described. In Chapter 4 technologies for

projection mapping is described. First, basic concept and technologies of projection mapping is described. Then how the actual projection mapping was carried out at Kyoto National Museum is described.

II. WHAT IS RIMPA?

RIMPA [7][8] is one of Japanese traditional art schools that started in 17th century, the early Edo period, by a painter, Sotatsu Tawaraya [9][10] who established an innovative painting style. Then another great painter, Korin Ogata [9][10], further developed this painting style in Kyoto. Then the art school spread to Edo, that is an old name of Tokyo, and the next great painter, Houitsu Sakai [9][11], inherited and further expanded the style. The painting style, succeeded in such a way, is called RIMPA.

Fig. 1 shows “the Wind and Thunder Gods,” probably the most famous RIMPA painting. The most distinctive features of RIMPA art are flourish use of gold and silver colors and bold object layout. Such features never existed before Sotatsu Tawaraya. This is the reason why RIMPA artworks are called “decorative.” Fig. 2 is a painting by Korin Ogata called “the Red and White Plum Blossoms.” Here again there is a very bold layout of objects. In the middle there is a river and in the river S-like waves, that are called “Korin Waves” created by him, are painted. And on both sides of the river there are apricot trees. At that time this kind of paintings with such a bold design never existed before. This style became so famous, as it is a totally new style found in decorative paintings.



Fig. 1. The Wind and Thunder Gods



Fig. 2. The Red and White Plum Blossoms

Also the human relationship among these three painters is not teacher-student relationship. The human relationship of RIMPA is special, called “Shishuku” that means a person

personally adores somebody. In other words, RIMPA artists did not learn directly from their teachers. Instead, a RIMPA painter was impressed by paintings of somebody, decided the painter as a teacher, and adored him. In such a way RIMPA school has continued. Usually, in any art school the history of a school is maintained by teacher-student relationship. However, in the case of RIMPA, painters did not meet their teachers, only were deeply influenced by their teachers, and thus have kept RIMPA history.

III. CONTENT CREATION

A. Basic concept

For the content creation, one of the authors, Naoko Tosa, led the team as an art director. As the created artistic content is to be used for the celebration of RIMPA 400th anniversary, it is adequate and reasonable to use several images that can easily be associated with some of well known RIMPA paintings. As the “Wind and Thunder Gods” is the most well known RIMPA paintings, the authors have chosen these gods as the main characters of the contents. At the same time these gods have a strong connection with the legend of Michizane Sugawara [12]. The legend says that once he was a prime minister of Japan in Heian period (late 8th century – late 12th century), but he lost his position because of a slander, and was exiled to Kyushu. As he strongly resented this, it is believed that he asked the Wind and Thunder Gods to bring evil to Kyoto as his revenge. In addition to Wind and Thunder Gods, the authors introduced several other images into the content, that can easily be associated with several famous RIMPA paintings

B. Story

Based on the legend of Michizane Sugawara described above, the authors introduced a simple story described below as a basic story of the whole video content. The whole content is named “21st Century Legend : Wind God and Thunder God”

Scene 1: This scene reminds audience of the historical person, Michizane Sugawara. His strong resent is shown by dynamically moving wave-like images. Responding to his pray the Wind and Thunder Gods appear and promise him to achieve the revenge.

Scene 2: This scene consists of dynamic wave-like and cloud-like images symbolizing the magic power of the Wind and Thunder Gods that are the transformation of Michizane Sugawara’s soul.

Scene 3: This scene indicates that the Wind and Thunder Gods are moving toward Kyoto with an intension of giving various disasters to Kyoto.

Scene 4: In this scene, a part of “Kyogen” (Noh farce) [13] called “Kaminani (Thunder God)” is played symbolizing that Thunder God is still wild and not matured. He does not conscious that he is a god and can give people either evil or wealth.

Scene 5: This scene symbolizes that the Wind and Thunder Gods, being affected by the traditional culture of Kyoto, become conscious of their own power and influence to people.

Then they transform into the form of human gods and abandon their original intention of giving disasters to Kyoto.

Scene 6: This scene symbolizes that the Wind and Thunder Gods are especially impressed by RIMPA artworks and decide to create RIMPA-like artworks and give them to Kyoto people.

Scene 7: As a finale, the Wind and Thunder Gods celebrate RIMPA 400th anniversary. First they fully cover Kyoto city by apricot flowers. Gradually the apricot flowers change into cherry blossoms. Then after flooding Kyoto city with such flowers, the Wind and Thunder Gods say good-bye to Kyoto and fade away.

C. Capturing of jumping-up liquid by high-speed camera: “Sound of Ikebana”

As basic technologies to create contents based on the story shown in 3.1, the authors have developed a method to shoot jumping-up liquid by a high-speed camera. A high-speed camera has been used in various situations that occur in very short time such as explosion of physical materials [14]. But most of the usages of a high-speed camera have been limited to scientific observation of physical phenomenon. On the other hand the authors have been interested in the fact that liquid can make beautiful forms with huge variations such as “milk crown.” Combining these together they had an idea of creating various jumping-up liquid forms by giving them sound vibration also shooting the phenomenon by a high-speed camera.

Based on repeated experiments by changing sound feature, liquid type, liquid viscosity, etc., the authors have found that huge variation of liquid forms can be created. Also they found that these created forms include many beautiful images that could work as materials for art creation, both in the form of video or still images. Fig. 3 shows the experiment setting for creating and shooting such phenomenon. By carefully selecting paint colors, by mixing several colors, and by changing paint viscosity, sound features, etc. the authors found that Ikebana-like forms could be created.

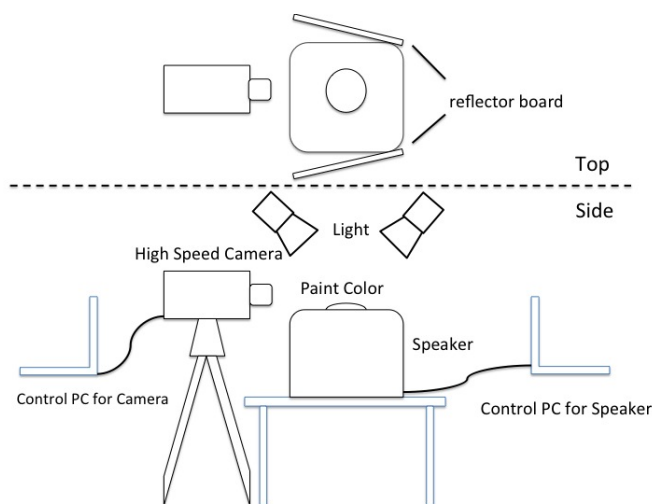


Fig. 3. Experimental setting of shooting jumping-up liquid by a high-speed camera.

Then by using several selected video images and by carefully editing them, Naoko Tosa, an art director of the team, created an artwork called “Sound of Ikebana [6].” Fig. 4 shows several examples of scenes of Sound of Ikebana. This artwork was exhibited at ArtScience Museum in Singapore for several months in 2013-2014. Also, as a finale of this exhibition, the projection mapping of Sound of Ikebana was carried out for four days using the façade of the museum. Fig. 5 illustrates one scene of the projection mapping. These exhibitions were successful and gave the authors the belief that contents based on the above creation process can become good materials for artworks. Also at the same time the authors recognized that contents created through such process would be well suited to a big event as projection mapping.

After this exhibition the authors continued the experiment using different types of materials such as oil, beads, nuts, etc. and found that video images obtained by the combination of several different materials are also very interesting and applicable to art creation.

In the creation process of the content described in 3.1, several combinations of physical phenomenon of vibrated materials shot by a high-speed camera were used as a basic method of the content creation.

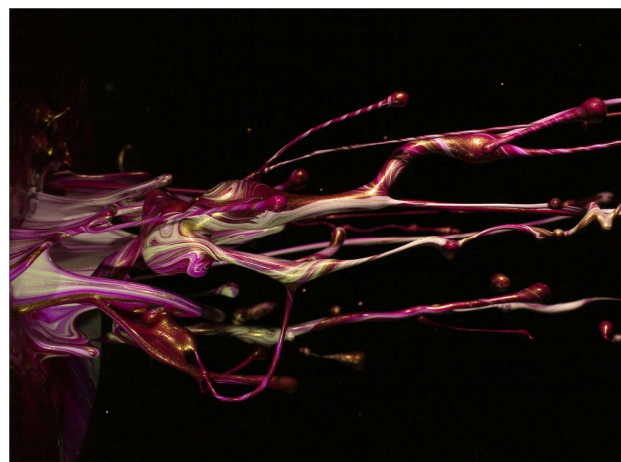


Fig. 4. Several shots of “Sound of Ikebana”



Fig. 5. A scene of the projection mapping of “Sound of Ikebana” carried out at ArtScience Museum in Singapore

D. Explosion of frozen flowers

In addition to shooting physical phenomenon of jumping-up materials that are vibrated by sound in the content creation process, another technique has been introduced. That is to shoot a physical phenomenon of frozen materials broken by hitting them by a small material such as an air-gun bullet. It is well known that soft materials such as rubber, plastic, etc. can explode once they are frozen and hit by a bullet. However most of such phenomena have been only for a target of scientific observation and only there are a few trials to apply it to art creation [14]. One of the authors, Naoko Tosa, proposed an idea that, if flowers in flower arrangement are frozen by liquid nitrogen, are broken by a bullet, and are shot by a high-speed camera, the obtained video images might visualize hidden beauty of nature and are adequate as materials of art creation. Based on this idea the authors carried out many experiments and found that through such creation process beautiful and brilliant video images can be obtained, which can be called as art. Fig. 6 shows the process of content creation based on this process.

The authors believe that the beauty of video images obtained through the methods described above exists based on the following reasons. One is that flowers arranged based on traditional or modern flower arrangement style have beauty in themselves. Modern flower arrangement style can give us the beauty of rich and flourish feeling. On the other hand Japanese traditional flower arrangement style emphasizes the importance of space with limited number of flowers and gives us the feeling of Japanese seasons, especially change among seasons. Therefore for the creation of contents for RIMPA 400th anniversary the authors mainly used flowers arranged in Japanese flower arrangement style [15]. Then the flowers are frozen by being put into liquid nitrogen and then broken by an air-gun shot. Fig. 7 shows one scene of the video images obtained through such processes.



Fig. 6. A shooting scene of a frozen flower.

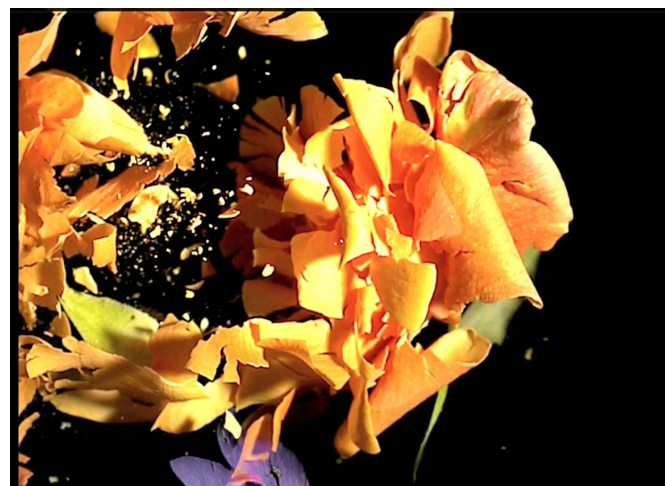


Fig. 7. An example of images obtained by shooting frozen flowers.

E. Collaboration with traditional culture: Ikebana and Kyogen

Another issue the authors had to consider is that Kyoto is an old cultural city and there are many well known artists working in their traditional art. Because of this it is strongly expected that collaboration with some of the traditional artists are carried out in the content creation process. Based on the story described in 3.1 and content creation process described in 3.2 and 3.3, the following collaboration between the authors, headed by Naoko Tosa, and these traditional artists have been carried out.

For the flower arrangement, the authors have decided to work with Mr. Ryuho Sasaoka who is a head of traditional flower arrangement school called Mishoryu Sasaoka [16]. The reason we have decided this is that most of flower arrangement artists do not like their arranged flowers to be broken. However, he showed an interest in such kind of art creation, because he thinks that it is not enough for a flower arrangement artist to show people flowers only in their full bloom. On the other hand, as everything changes, he is interested in the

process of blooming flowers are broken indicating the process of decaying flowers. Therefore the collaboration went on so that he prepares various kinds of flower arrangements and the authors break the flowers, and shoot the flower breaking process.

In addition as the story described in 3.1 indicates, a performance of Kyogen (Nor farse) [13] is expected to be included in the content. For this the authors have asked Ippei Shigeyama, a young Kyogen actor in the well known Shigeyama family, to perform the Kyogen “Kaminari.” They shot the performance and used the captured video as a part of the whole content.

IV. PROJECTION MAPPING

Once the content is ready, the authors have to think how to show the content in the form of projection mapping [1][2][3]. In this Chapter the basic concept of projection mapping and how the authors carried out projection mapping at Kyoto National Museum are described.

A. Concept of projection mapping

Projection mapping is a technology to project still and/or moving images on a big screen using projectors. For projection, usually multiple projectors with high brightness are used. Although to prepare a flat big screen is one solution, usually non-flat screen as a building is used as a projected object. Usually surface of a building has a complex surface such as one including unevenness, doors, windows etc.. Also a building has its specific form. This means that a building is a 3D object instead of a 2D object such as a screen. Therefore it is required to carry out specific way of doing projection.

Fig. 8 illustrates how a projection mapping is carried out. First the projection mapping system has to have a 3D model of an object on which projection mapping is to be done. Then on image (still or moving) to be projected inverse conversion of the 3D surface of the object is carried out. Next the image is divided into multiple images depending on the shape of the object. If the width of the object is long compared with its height, the image is horizontally divided into multiple images. Also if the surface of the object has a big unevenness, the image should be divided into multiple images such as images with short focus point and those with long focus point. Then each of the images is allocated to a specific projector. There is a controller that synchronizes images carried out by different projectors so that the whole image looks as one continuous image.

This means that the number of necessary projectors used for a projection mapping would vary a lot depending on the characteristics of an object such as its size, its surface unevenness, its shape, etc. Also the environment of the object would affect a lot to the number of required projectors. If the object is situated at a rather dark area, the number of projectors could be reduced. On the other hand if the surrounding area is rather bright, a lot of projectors would be necessary to give a clear image of content.

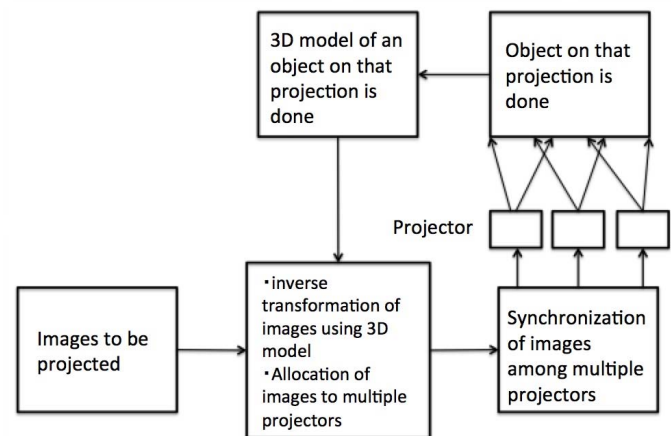


Fig. 8. Mechanism of projection mapping

B. Projection mapping at Kyoto National Museum

The authors carried out a projection mapping using the content described in Chapter 3 at Kyoto National Museum in March 2015. Fig. 9 shows the two buildings of the museum; an old building and a new building. Based on some internal discussions and the ones with the museum, they have decided to carry out projection mapping on both of the buildings. As a big part of the new building is glass wall, and projection on glass does not work well, the projection area of the new building is much constrained. However, by utilizing this horizontally long projection area as a bridge between backyard and a main stage of virtual Noh theater [13], we tried to give audience the feeling that they are watching Noh play.



Fig. 9. Kyoto National Museum: Old Building (above) and New Building (below).

Eight projectors with the brightness of 22,000 lumen were used for the projection on the new building and twelve

projectors with 22,000 lumen were used for the projection on the old building. Fig. 10 shows the setting of the eight projectors for the projection on the new building. Also Fig. 11 illustrates an example of the actual image of the projection mapping. The authors asked Hexogon Solution [18], a Singapore company dedicated to projection mapping, to carry out the projection part of this event.



Fig. 10. Setting of eight projectors used for the projection onto the new building.



Fig. 11. Scenes of projection mapping at Kyoto National Museum (top and bottom: Old Building, middle: New Building).

V. CONCLUSION

The projection mapping organized by the authors in March 2015 is described in this paper. Although projection mapping has become very popular as a big event, so far research on projection mapping is too much focusing only mapping and projection technologies. As projection mapping has already its market, contents should play an important role.

2015 is 400th anniversary of RIMPA, well known Japanese art school, and in Kyoto various events commemorating RIMPA 400th anniversary are and will be held. As the event described in this paper was held as one of RIMPA 400th anniversary events, how to develop contents by combining cultural issues and technologies is the most important point in content creation. RIMPA has the features of using rich gold and/or silver colors, bold design, and these features have affinity with technologies. The authors have developed several technologies for content creation taking these features into consideration. For the contents creation high-speed camera plays the most important role and using it two new technical methods for contents creation have been studied and adopted.

One is to give liquid-like materials sound vibration, make them jump, and shoot the jumping liquid by a high-speed camera. By using gold and silver paints, various beautiful Ikebana-like forms were created and these forms can be considered as modern expression of RIMPA. Another method is that actual flowers are frozen by liquid nitrogen and then broken by being shot by an air-gun. Also by using this method various beautiful video images were obtained. By combining these two types of video images and also introducing a simple story, which has also a deep cultural meaning, the content of the projection mapping called “21th century legend : Wind and Thunder Gods” was created.

For projection mapping two buildings of Kyoto National Museum was used. Big wall of the old building was considered as a Noh main stage. Also horizontally long wall of the new building was considered as a bridge connecting backyard and main stage of Noh theater. Then following the story series of scenes were projected onto both the old building and the new building. For the projection twenty projectors with the brightness of 22,000 lumen were used; twelve projectors for the old building and eight for the new building. During the four-day event, nearly 20,000 people came to watch the event from all over Japan and the event was quite successful.

Through this event it was recognized that projection mapping is a good method to exhibit image based artworks, where culture and technology are well integrated, and give people a strong impression. In the future new technologies are required to be developed to make it easier to create artistic contents including cultural issues by using technologies.

In 2020 Tokyo Olympic will be held. At the Tokyo Olympic 2020 there will be several big events such as opening ceremony, closing ceremony, etc. At such big events it is required and expected to appeal not only advanced technologies of Japan but also rich traditional culture of Japan. Projection mapping is very well suited to such a big event. Contents where culture and technology are well combined, as described in this paper, would be most suitable to such events

and are expected to be used at Tokyo Olympic 2020. Fig. 12 illustrates how projection mapping is used in a big event such as an opening of Tokyo Olympic 2020 taking the opening ceremony of Sea Games 2015 held in 2015 in Singapore as an example.



Fig. 12. Projection Mapping at the Opening of Sea Games 2015 held in Singapore. (This projection was carried out by Hexogon Solution.)

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